

SEMICONDUCTORS—PART 2 (ASIA'S PROGRESS AND CHALLENGES)

Asia produces 70% of the world's microchips. What's behind this massive market share and what may chip away at it?

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Key Takeaways:

- The “Made in China 2025” industrial plan aims to increase the Asian superpower's self-reliance in semiconductor manufacturing.
- Meanwhile, U.S. trade sanctions seek to temper China's ambitions in the microchip space.
- Taiwan has emerged as the world's leader in semiconductor production, supplying companies from Apple to Intel.
- Taiwan's increasing tensions with China are a cause for concern.
- Singapore has become an attractive alternative for companies wanting to produce microchips abroad and diversify their supply chains.

Asia is the global capital of semiconductor manufacturing with three countries—Taiwan, South Korea, and Japan—among the top five leading producers of microchips (the others are the United States and the Netherlands). Asian countries produce more than 70% of the world's semiconductors, according to Bank of America estimates. Moreover, of the three firms able to manufacture the most advanced and smallest semiconductors, two are based in Asia: Taiwan Semiconductor Manufacturing Company (TSMC) of Taiwan and Samsung of South Korea (U.S.-based Intel is the third). The fact that only three countries can produce 2- or 3-nanometer microchips highlights the unceasing pace of progress in this industry.

Asia also is seeing new competitors emerging from within. The ambitious “Made in China 2025” initiative hopes to have the Asian superpower domestically producing 70% of its microchip needs within the next four years, and Singapore has put in place a series of policies designed to attract foreign semiconductor manufacturers.

Yet, Asia's leadership in the semiconductor space isn't without challenges, which include U.S. trade sanctions against China; increased tensions between independently governed Taiwan and mainland China; and keeping up with Moore's Law of doubling the number of transistors in a chip about every two years.

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Here's a country-by-country rundown of the Asian semiconductor marketplace.

China

In discussing China, we need to start with the Biden administration's continued hardline trade stance that's meant to address what the U.S. sees as unfair economic practices, egregious human-rights abuses, and intellectual property theft, among other issues. The relationship between the two superpowers remains strained with a bleak outlook.

U.S. sanctions against China include blocking access to sensitive Western intellectual property. Late last year, for instance, the U.S. added dozens of Chinese companies to an economic blacklist, denying licenses that would have allowed China to obtain advanced technology that can produce chips smaller than 10 nanometers. The move likely puts China years away from producing advanced semiconductors.

The U.S. also has put pressure on allies to halt sales to China. ASML, a low-key but powerful Dutch company that's the world's dominant maker of photolithographic (EUV) machines, maintains a near monopoly along the semiconductor manufacturing supply chain. Machines produced by ASML allow advanced producers to fabricate the smallest semiconductor chips. Under pressure from the U.S., the Dutch government recently blocked the sale of ASML's \$150-million machines to China.

Partly in response to this, China may be ramping up its ambitious "Made in China 2025" industrial plan with the goal of domestically producing within four years 70% of the semiconductors it uses. According to Qichacha, a Chinese corporate records database, over twenty thousand new Chinese companies associated with semiconductors were registered in 2020 alone. Separately, the media giant Nikkei Asia reported that more than 160 Chinese semiconductor companies received more than \$6 billion in public and private funding during the first half of 2021.

But despite grand plans and large investments, China's march toward self-reliance has already experienced several stumbles, which isn't unexpected given the complexities of the industry. The chip-manufacturing supply chain depends on hundreds of different inputs and components. The difficulties involve capital-intensive processes that are costly to modernize and maintain given the rapid pace of technological progress. And while an abundance of capital initially fueled China-based startups, the capital-intensive nature of the industry—on top of U.S. sanctions—will likely lead many of these cash-burning companies to fail. Media stories of rising chip-related bankruptcies and abandoned projects in China have already started to surface.

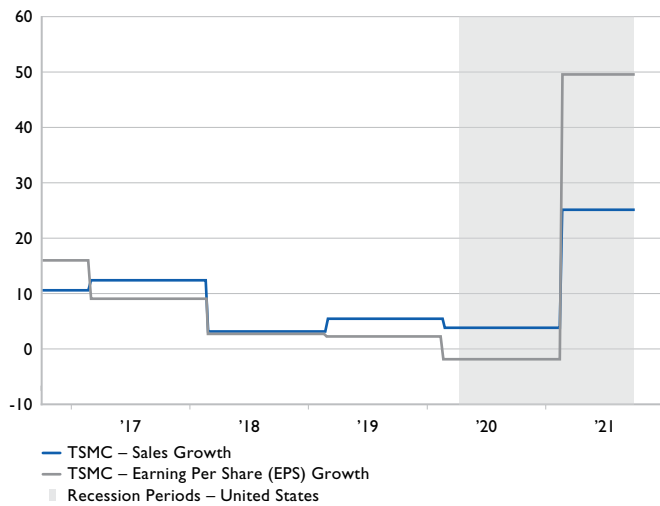
However, there also are bright spots in China's quest for semiconductor independence. China's domestic supply chain can already produce chips (albeit older) without external resources or trading partners. And then there's the partially state-owned Semiconductor Manufacturing International Corp. (SMIC), the country's most advanced and largest semiconductor foundry. Soon, SMIC will likely provide advanced chips for many products made in China, including smartphones and cars, which allows the country to depend less on imports—furthering its goal of semiconductor self-sufficiency.

Taiwan

Taiwan, officially part of the Republic of China but governed independently, has become a global leader in the manufacturing of semiconductors through its small-to-medium enterprises (SMEs), which drive Taiwan's economy and have been credited with helping TSMC become the world's most valuable semiconductor company and top supplier for companies such as Apple, AMD, and Nvidia. TSMC was originally created to support Taiwanese semiconductor fabless SMEs that designed unique and niche chips, allowing its productions to adapt well to a diverse clientele. TSMC's strong and durable competitive advantages, however, allowed the company to secure over half of the global semiconductor foundry market.

From a fundamental perspective, TSMC sales and earnings growth has picked up and may accelerate with greater demand for chips.

Figure 1:



But a giant shadow looms over Taiwan's success in semiconductor manufacturing: China, which has been signaling—increasingly of late—that it will place the democratically run island province under the mainland Communist government. It's interesting to note that China buys Taiwanese chips but doesn't presently count them as part of the "Made in China 2025" initiative.

Like the U.S., Japan has continued to ratchet up concerns over China's aggressive rhetoric toward Taiwan. A recent Japanese government white paper for the first time called for a greater sense of vigilance over Taiwan and the need to defend it if China decides to upend the status quo. This move deviated from Japan's previous attempts to avoid offending China, which is its biggest trading partner.

A clear sign that Japan would join the U.S. in defending Taiwan further complicates China's plans to reunite Taiwan with the motherland. Whether or not Taiwan falls under China, many other technologically competitive countries, such as Singapore, could potentially benefit from ongoing supply-chain diversification efforts.

Finally, although Taiwan currently dominates the global semiconductor manufacturing industry, history has shown that technology leadership tends to change hands. Before Taiwan, Singapore and Japan stood on the podium of semiconductor technology. Like the U.S., Japan and Singapore lost market share over the years but have rekindled their ambitions anew.

Japan

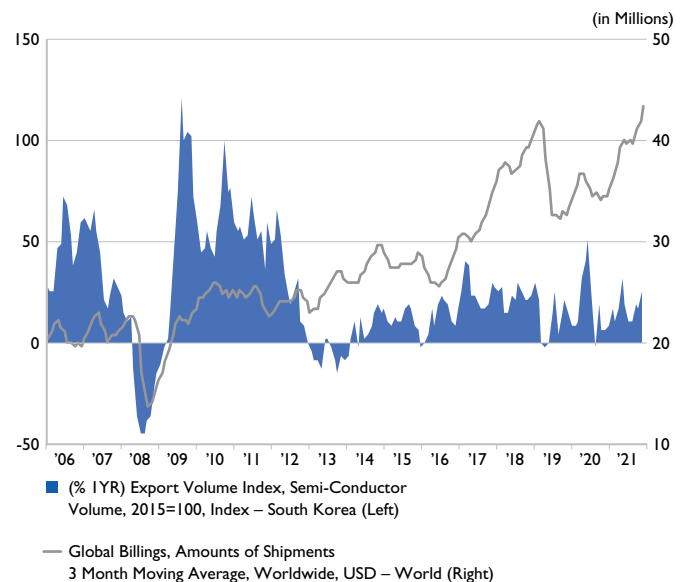
Japan depends on Taiwan to obtain most of its semiconductor chips. Although Japan has more semiconductor plants than any other country, it represents only around 10% of the global chip market share. Furthermore, Japanese semiconductor manufacturers are small and only produce older-generation chips. To become more self-reliant, Japan is trying to attract TSMC to build a local facility, which is similar to the route the U.S. has been taking (as we suggested in [part I of our semiconductor "Insights" commentary](#)).

South Korea

South Korea, home of semiconductor-manufacturing giant Samsung, succeeded in becoming the top dynamic random-access memory (DRAM) chip producer with government-backed, large-scale capital funding, which allowed a few companies to mass-produce standardized chips. Now, the country has its eyes set on taking the crown as the largest global chipmaker. Recently, South Korea unveiled a 10-year, \$450-billion plan to build the world's biggest semiconductor hub, as competition for the global title is intensifying.

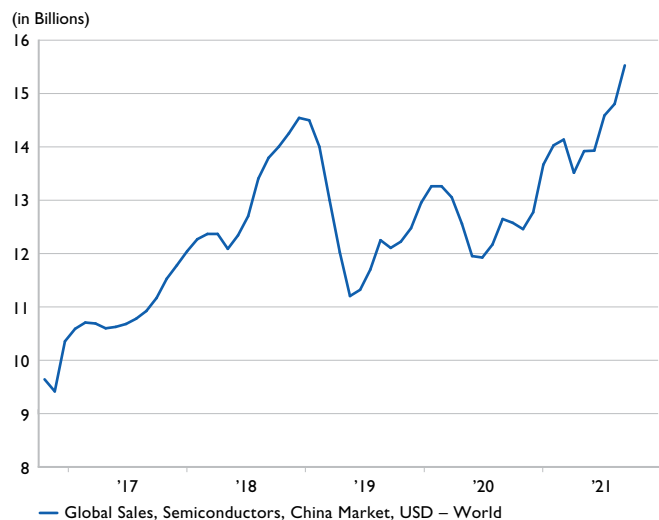
In the more near-term, South Korea's semiconductor export volume growth has the potential to accelerate as global semiconductor shipments have increased.

Figure 2:



However, given that a sizeable demand for chips stems from China, U.S. sanctions could potentially tamper South Korea's export volume.

Figure 3:



Singapore

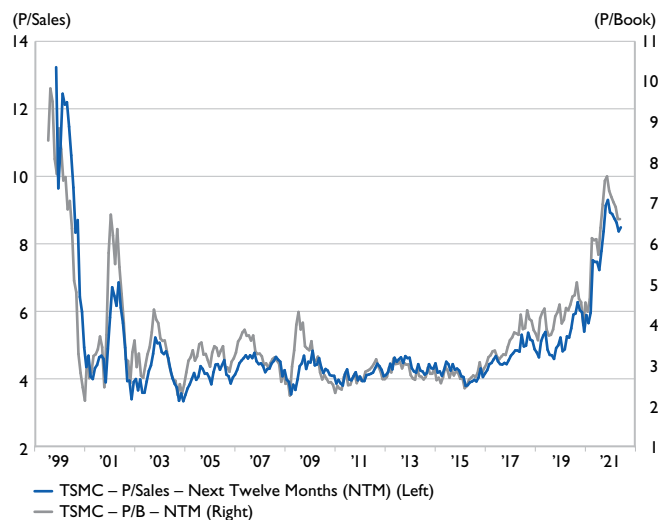
Singapore offers favorable tax and regulatory incentives and has a pool of high-skilled labor, which makes it an attractive location for investments in semiconductor manufacturing. U.S.-based semiconductor manufacturer GlobalFoundries has plans to invest \$4 billion to expand production in Singapore with facilities expected to become operational by 2023. This move reflects the shift to diversifying global supply chains (rather than profit motives), as tensions between the U.S. and China continue to remain high.

Emerging Markets Asia Market Impact

With respect to international equities, Taiwan-based TSMC maintains the largest weight of the MSCI EM Index at 6%. South Korea-based Samsung also has a high weight at 4%. So, until U.S. domestic capabilities are built up years from now, emerging markets are more likely to benefit from greater semiconductor demand.

Taking a deeper look at TSMC, its price multiples are elevated, but they have reached higher marks in the late-90s—when market demand was not accelerating at its present pace.

Figure 4:



This could suggest that companies like TSMC have more upside potential as semiconductors play a greater role in the modern world.

Developed foreign markets also may be affected by the shifts in supply chains. While Singapore represents only a mere 1% of the MSCI EAFE Index, Japan constitutes nearly a quarter of that index.

Stay tuned for next “Insights” on developed foreign markets.

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